ASPIRING EARLY CHILDHOOD TEACHERS' SELF-PERCEPTION OF THEIR COMPETENCE IN THE INTEGRATION OF DIGITAL TECHNOLOGIES INTO EARLY CHILDHOOD EDUCATIONAL PRACTICE

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Abstract

The aim of this research is to consider the differences in aspiring early childhood teachers' self-perception of their competence in the integration of digital technologies into early childhood educational practice, before and after the realization of the teaching process, and before and after passing the exam for the elective course titled "An early childhood teacher in a digital environment". The research sample consisted of thirty-five third-year students of the Preschool Teacher Training and Business Informatics College of Applied Studies - Sirmium, who took and passed the exam in the elective subject "An early childhood teacher in a digital environment". The results of the study show that aspiring early childhood teachers assess their competence for the integration of digital technologies into early childhood educational practice more positively after attending classes and taking the exam in the course "An early childhood teacher in a digital environment". Future early childhood teachers feel more competent in applying digital technologies to all four areas of early childhood teachers' work: direct work with children, real program development, professional development and professional public action.

Key words: digital technologies, aspiring early childhood teachers' self-perception of competence, optional course, preschool education program, early childhood educational practice

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САМОПЕРЦЕПЦИЈА КОМПЕТЕНТНОСТИ БУДУЋИХ ВАСПИТАЧА ЗА ИНТЕГРАЦИЈУ ДИГИТАЛНИХ ТЕХНОЛОГИЈА У ВАСПИТНО-ОБРАЗОВНУ ПРАКСУ

Апстракт

Циљ истраживања је сагледавање разлика у самоперцепцији компетентности будућих васпитача за интеграцију дигиталних технологија у васпитно-образовну праксу пре и након реализације наставе и положеног испита из изборног предмета - Васпитач у дигиталном окружењу. Узорак истраживања чинило је 35 студената треће године студија Високе школе струковних студија за васпитаче и пословне информатичаре – Сирмијум који су одслушали и положили испит из изборног предмета Васпитач у дигиталном окружењу. Резултати студије показали су да будући васпитачи позитивније процењују своју компетентност за интеграцију дигиталних технологија у васпитно-образовну праксу након слушања и полагања испита из предмета Васпитач у дигиталном окружењу. Будући васпитачи се осећају компетентнијим да дигиталне технологије примењују у сва четири подручја рада васпитача: подручје непосредног рада са децом, подручје развијања реалног програма, подручје професионалног развоја и подручје професионалног јавног деловања.

Кључне речи: дигиталне технологије, самоперцепција компетентности будућих васпитача, изборни предмет, програм предшколског васпитања и образовања, васпитно-образовна пракса

INTRODUCTION

Today's generations of children consider digital technologies a natural and interesting part of growing up, and they are often in contact with them from the earliest age. However, the use of digital technologies in the process of children's learning and development in preschool institutions is still rare. Therefore, the application of digital technologies in the process of learning and development of preschool children in our preschool institutions and, more broadly, in early childhood educational practice, is limited to equipping institutions and kindergartens, and to developing the digital competencies of employees, students, or aspiring early childhood teachers.

The challenge we as teachers in institutions of higher education face is related to the preparation of aspiring early childhood teachers for the integration of digital technologies into the preschool program, which is of a different orientation compared to the previous ones. Why is this important? It is because the orientation of the preschool curriculum determines the attitude towards digital technologies and the way digital technologies are used in early childhood educational practice, and that, in turn, influences the design of subjects aimed at preparing aspiring early childhood teachers.

In order to fully understand the issue of integrating digital technologies into early childhood educational practice, we will refer to the need for continuous changes in the study programs for early childhood teach-

ers, which are conditioned by scientific knowledge and new educational policy documents.

The paradigmatic shift from the empirical-analytical (positivist) to the interpretive and critical paradigm (Vujičić, 2017) has caused changes in the perception of the child, educational practice, and the role of early childhood teachers. The modern paradigm understands the child as an active co-constructor of his own knowledge, and the theories and hypotheses about the world he lives in and interacts with on a daily basis (Barth, 2004). The child learns through social interactions with all actors in the early childhood educational process, and actively participates in decision-making, building knowledge and changing the image of the world around him. An early childhood teacher is not a person who transfers knowledge, but a professional who continuously researches and learns about ways and strategies of teaching children, and who constantly tests ways and means of creating knowledge in the specific conditions within the preschool institution (Miljak, 2005). In other words, according to this conception, an early childhood teacher is not someone who executes pre-prescribed programs, but a researcher of real processes of children's learning and development, and a creator of real programs in early childhood educational practice.

In accordance with the aforementioned shift, changes were made in the documents related to the education policy of the Republic of Serbia. Since 2019, the Bases of Preschool Education and Education Program "Years of Rise" have been successively introduced into Serbia's education policy ("Official Gazette of the Republic of Serbia - Education Gazette", No. 16/2018). The Rulebook on Standards of Competence for the Profession of Early Childhood Teachers, important for our work and for the early childhood teachers' professional development ("Official Gazette of the Republic of Serbia - Educational Gazette", No. 16/2018), is also harmonized with the new Concept.

According to the new Concept, an early childhood teacher, starting from the theoretical-value postulates and goals of the program aimed at supporting the welfare of the child through actions and relationships, and using strategies based on the principles of the real program, develops a real program in a concrete context which consists of the culture and structure of the institution, or the physical space and the children, early childhood teacher(s), family and community which inhabit it. It follows from this that early childhood educational practice is not something that is determined, and can be predicted and planned in advance, but something that is rich in unpredictable, unexpected and unplanned influences and activities.

Taking the mentioned changes into consideration, we designed and implemented an elective subject – "An early childhood teacher in a digital environment", with which we tried to contribute to building students'

competence in the field of integrating digital technologies into early childhood educational practice, in all four areas of early childhood teachers' work: direct work with children, development of a real program, professional development and professional public action. In this paper, we want to see how students, aspiring early childhood teachers, see their competence in the field of using digital technologies in their future professional practice.

THEORETICAL BACKGROUND

The Role of Students' Education in Building Competencies for the Integration of Digital Technologies into Future Early Childhood Educational Practice

Educational colleges and faculties play an important role in providing students with the opportunities for building competencies for the adequate application of digital technologies in early childhood educational practice. "If we expect digital technologies to reach kindergartens, they should first reach early childhood teachers' schools" (Sillat, Kollom & Tammets, 2017: 1806). This indicates that it is necessary that the curriculum in the initial education of early childhood teachers also contains subjects with syllabi aimed at developing digital competencies. Regarding this, higher education teachers have a double responsibility: they should not only use digital technologies in their own teaching but should also provide opportunities for students to learn how to integrate digital technologies into future professional practice in accordance with the modern understanding of preschool children's learning and development.

Recent research shows that there is a mismatch between the level of digital competence expected of future teachers/early childhood teachers and the level of training for the integration of digital technologies which they are provided during their education (Instefjord & Munthe, 2017). The authors (Kalogiannakis, 2010; Liu & Pange, 2015; Romero-Tena et al., 2020) point to the correlation between the digital technologies courses that students attend during schooling and the use of digital technologies in practice, inadequate course plans and the inadequate preparation of aspiring early childhood teachers for their professional practice. On the other hand, it is emphasized that the adequate preparation of future early childhood teachers during their studies can determine the extent to which they will use digital technologies in their future professional practice (Nikolopoulou & Gialamas, 2015).

What do we mean by adequate preparation of future early childhood teachers? Regarding this question, it is necessary to explain the terms 'competence for something' and 'competence of an individual'. Competence for something exists in a real context and is developed in professional practice – it enables the individual to achieve goals that

he/she deems desirable. The competence of an individual is manifested through their ability to use resources in order to take action, and it is part of an intentional and planned practice (Martiner, Raymond & Gauthier, 2001).

Being competent implies more than the sum of selected and individual skills and knowledge. The triad of 'know, do and be' (or 'knowledge, skills and values') should be integrated in such a way that the individual is able to combine different aspects of their knowledge and skills in response to situations and challenges in a given context in accordance with basic values (Pavlović Breneselović, 2014a). By using the term competence (knowledge of doing something) instead of the term 'skills', the difference between the technical understanding of early childhood educational work, as the application of individual skills, and the ethical nature of early childhood educational practice, which is essentially reflective and value-based, is highlighted. These values are derived from understanding the nature of the child and how they learn, the values given through the concept of preschool education programs, and understanding the place and role of technology in the modern world and in relation to children's welfare (Pavlović Breneselović, 2014b).

Competence for the integration of digital technologies in preschool education is understood as practical wisdom that integrates values, a child's knowledge and their learning potential, and the potentials and limitations of digital technologies. All this knowledge can build skills for using digital technologies in a way that supports children's welfare and a quality program (Pavlović Breneselović, 2014a). Practical wisdom is developed through reflection, by looking at practice from different perspectives, and by looking at and understanding situations in a new way so as to use this understanding as a basis for developing new and different practices (Ryan & Grieshaber, 2005).

The adequate preparation of aspiring early childhood teachers should take into account the fact that ways of integrating digital technologies as a learning resource in real preschool education programs should be framed by the conceptual starting points of the program value-theoretical postulates about children and how they learn, the characteristics of kindergarten practice and the way of adults' (early childhood teachers, parents and members of the local environment) participation (Pavlović Breneselović, 2021). This would mean that the successful preparation of aspiring early childhood teachers in this field implies support for the development of early childhood teachers as researchers of their own practice, and that learning, in addition to teaching at an institution of higher education, should take place in direct practice. This is achievable through collaboration with colleagues, the early childhood teachers and teachers of a higher education institution, or by including reviews of the program and its starting points. Furthermore, it can be based on developing a specific topic/project. Improvement can also be expected by provid-

ing time and opportunity for experimentation and reconsideration, including the development of digital skills through participation in specific activities in all four areas of early childhood teachers' work.

The Integration of Digital Technologies into Early Childhood Educational Practice: Possibilities and Limitations

Decisions on whether and how to use digital technologies in early childhood educational practice depend on the attitudes, knowledge and skills of teachers/early childhood teachers (Hew & Brush, 2007). Research shows that the integration of technology into educational practice requires teachers'/early childhood teachers' access to relevant equipment, support in the workplace and positive attitudes towards technology (Kopcha, 2012). Ertmer et al. (2012), distinguish between first - and second-order barriers to digital technology integration. First-order barriers are defined as external, and they include areas such as access to resources, training and support, while second-order barriers are internal and include teachers' trust in, beliefs about, and perceived value of technology. Kopcha (2012) points out five barriers to technology integration that are dominant in the research literature: lack of access to technology, teachers' vision regarding technology, teachers' beliefs about the usefulness of technology, time required for the preparation of use of technology, and lack of professional development related to the use of technology in professional work (Kopcha, 2012).

Similarly, the technology integration model – will, skill, tool (WST model) (Knezek & Christensen, 2008), was developed to explain the reality of digital technology integration in an educational context. The model identifies three key elements for a high level of technology integration: the teacher's willingness to use technology in the classroom (attitudes about technology), his or her skills in using technology (digital competence) and satisfactory access to technology as a tool (access to technology) (Knezek & Christensen, 2008).

Pajares (1992) suggests that attitudes are formed on the basis of a set of beliefs about a particular object or situation, which in turn direct a person's behavior (Eisen, 2001). When groups of beliefs are organized around an object or situation and predisposed to action, this holistic organization becomes an attitude. Beliefs can also become values, which include evaluative, comparative and judgment-judging functions. Beliefs, attitudes and values form an individual's belief system (Pajares, 1992). A teacher/early childhood teacher can have many positive and negative beliefs about the use of technology, about his/her self-efficacy as a teacher/early childhood teacher, about his/her students/children. Ultimately, his or her attitude toward integrating technology into practice will be based on an overall assessment of these beliefs. It follows that one of the fun-

damental reasons why digital technologies are or are not used in the early childhood educational practice is directly related to the intentions and capacities of teachers/early childhood teachers to integrate them (Gialamas & Nikolopoulou, 2010). That is why we should pay attention to psychological factors, such as teachers' self-perception of their competencies for digital technology integration. The psychological context of practice, especially the perceptions of teachers/early childhood teachers, is crucial for understanding their daily work with digital technologies (Wang et al., 2008). Thus, the perceptions that teachers/early childhood teachers have about the use of digital technologies can strongly influence their classroom/group practice (Austin et al., 2010). Teachers' beliefs and perceptions are important because they provide the best indicators of the decisions that individuals make throughout their lives. Therefore, they act as guides for thinking and behaving, and positively or negatively affect individual work and learning (Vries, Van de Grift & Jansen, 2014). The study (Dong, 2018) points to a high correlation between teacher's perception and pedagogical practice, and the importance of providing effective learning and development programs so that teachers/early childhood teachers can use a wider range of pedagogical strategies to support children's use of digital technologies.

So far, there have been several studies (Romero-Tena et al., 2020; Sillat, Kollom & Tammets, 2017) that explore the changes needed in the education of future early childhood teachers to support the development of their digital competencies and the integration of digital technologies into their future professional practice. Our research is aimed at examining whether students', or aspiring early childhood teachers', self-perceptions of their competence for the integration of digital technologies into early childhood educational practice can be improved under the influence of the elective subject "An early childhood teacher in a digital environment".

The Concept of the Elective Course
"An Early Childhood Teacher in a Digital Environment"

How did we design the elective course "An early childhood teacher in a digital environment"?

We started from the socio-constructivist, postmodernist and post-structural perspectives, which are today present in the perception of various aspects of the system of social care for children and preschool education, the preschool curriculum and teaching methods (Woodhead, 2012).

'Developmentally appropriate practice' (DAP) has long been a catalyst for significant debates about what should be the framework of preschool education policy and practice. The concept of 'developmentally appropriate practice' was most explicitly formulated by the National Association for the Education of Young Children in the United States in the 1980s as a 'scientific defense' of play-based preschool programs (Bredekampf, 1987). The DAP

concept largely reflects the values based on the traditional child-centeredness of preschool programs, reinforced by Piaget's theory of development, emphasizing the universal stages of development, the importance of free play, research and learning that is based on the child's activities, as well as the guiding and supporting role of trained practitioners (Woodhead, 2012). One of the ways of opposing idealized universal developmental assumptions and implicit 'developmentally appropriate practices' is the alternative concept of 'contextually appropriate practice' (KAP) (Woodhead, 1998). By providing an alternative concept, attention is drawn to a different understanding that early childhood policies, services, educational programs and practices must take into account the contexts in which children live, the material and cultural resources available to their parents and community, and the expectations and aspirations of parents and the community in relation to children (Woodhead, 2012). By placing the concept of 'contextually appropriate practice' against the concept of 'developmentally appropriate practice', attention is drawn to a key theoretical discussion of the nature of child development. A significant portion of sociocultural research challenges the idea of defining development by age (Rogoff, 2003; Vygotsky, 1998). This research, therefore, also challenges the idea that development and age can be used to define and construct programs. Three key topics which are important for preschool education policy are particularly highlighted: (1) diversity in early childhood (respect for diversity between and within societies, and recognizing the challenges of social changes, such as migration and multiculturalism, are essential issues for social care policy and practice in relation to children and preschool education); (2) development as a social and cultural process (instead of viewing early childhood as a universal, decontextualized process of development towards maturity, which is taken for granted, attention is drawn to the inclusion of young children in a range of environments, relationships, activities and skills through which they acquire cultural competences and build identity); and (3) early childhood as a social construct (the socio-cultural paradigm emphasizes that the contexts and processes of early childhood are shaped through human activity which is by its nature social and always mediated by cultural processes, including different, sometimes opposing cultural viewpoints on the needs of young children in relation to their individuality, gender, ethnicity, as well as a number of other factors) (Woodhead, 2012). Socio-constructivist, postmodernist and post-structuralist perspectives in particular have influenced the liberation from narrow definitions of what is considered natural, normal and necessary in development, creating room for a historical and political perspective on how our knowledge and beliefs about young children, and early childhood institutions, policies, practices and theories shape children's lives (Qvortrup et al., 1994; James & Prout 1990; according to: Woodhed, 2012).

Support in designing the elective course came from the Basics of the preschool education program "Years of Rise" ("Official Gazette of

RS - Education Gazette", No. 16/2018) and its main points: (1) the child is understood as a unique and complete being full of potential; (2) the child is creative, an active participant, committed to learning, and a playful gamer and explorer; (3) the aim of the program is to support the personal, professional and social well-being of the child through action and relationships; (4) the child learns in an integrated manner, and learning is a process of the co-construction of knowledge with peers and adults in situations that have personal sense and meaning for the child; (5) space has physical, social and symbolic dimensions that support research, exchange, participation and a sense of belonging (Pavlović Breneselović and Krnjaja, 2014); (6) the educator develops the program through planning, joint development, and monitoring and evaluation through documentation; (7) the dominant methical approach is project learning – connecting with specific experiences and life topics of children; (8) research of alternative solutions; (9) the appreciation and strengthening of children's power (Pavlović Breneselović and Krnjaja, 2014); (10) the project is guided by a question, an idea and/or the intention of in-depth research into a problem that is meaningful and challenging for children to research and through which they create authentic solutions ("Official Gazette of RS - Education Gazette", No. 16/2018); and (11) documentation is in the function of developing a realistic program through dialogue and critical review.

In addition to the theoretical assumptions and the "Years of Rise", the Rulebook on Standards of Competences for the profession of an early childhood teacher and his professional development ("Official Gazette of RS – Education Gazette", No. 16/2018) had an important role in creating the syllabus of the elective course "An early childhood teacher in a digital environment".

In the following text, we state the goal of the course, its expected outcomes, and the content of the course (theoretical and practical teaching).

The aim of the course. The aim of the course is to develop a culture of using digital technologies in the professional practice of early childhood teachers. The development of digital competencies in the function of realizing the professional role of early childhood teachers is addressed through four areas: direct work with children, developing a real program, professional development and professional public action.

Outcome of the course. The course is expected to result in students knowing the place, role and importance of digital technologies integration in all four areas of early childhood teachers' work. A student should be able to: assess the quality, reliability and usability of information; apply digital technologies in direct early childhood education practice; use digital technologies in planning activities and designing the necessary materials, and in observation, evaluation and documentation; use digital technologies to work with data; control the dangers of digital

technologies; develop awareness and habits in children and parents for the adequate use of digital technologies; apply digital technologies in the exchange of information with family, colleagues, associates, the local community and other stakeholders and institutions; and use digital technologies for professional development and professional public action.

Theoretical teaching. Digital environment – basic concepts and terminological determinants; digital competence in the standards of competence for the early childhood teachers profession and his professional development; creating an environment for the use of digital technologies in professional practice; Internet search; a student works on a project in a digital environment; digital technologies in the function of exchanging information with a family, colleagues, local community; immediate early childhood education practice with children with the support of digital technologies; planning with the support of digital technologies; joint development of programs with the support of digital technologies; monitoring, documentation and evaluation with the support of digital technologies; professional development of early childhood teachers with the support of digital technologies; professional public action with the support of digital technologies; limitations and shortcomings of the application of digital technologies in professional practice; child safety on the Internet; challenges of parenting in a digital environment.

Practical teaching. Practical teaching outcomes include a focus on sources of knowledge in a digital environment; solving problems in the web environment; digital tools for collaboration and communication; digital tools for creating presentations; digital tools for creating and processing, photography, video and audio content; digital tools for creating didactic games, quizzes, questionnaires; digital tools for creating interactive books; project work; application of digital tools in planning; application of digital tools in program development; application of digital tools in observation, evaluation and documentation; application of digital tools in the field of practice research; use of digital tools in professional development; use of digital tools in the function of promoting preschool education and the profession of early childhood teachers; risks in a digital environment.

METHODOLOGY

The aim of this research is to see the differences in aspiring early childhood teachers' self-perceptions of their competence for the integration of digital technologies into early childhood educational practice, before and after attending classes and passing the exam in the elective course "An early childhood teacher in a digital environment".

We wanted to find out if there was a change in the self-assessment of competence in aspiring early childhood teachers for the integration of

digital technologies under the influence of the implementation of the elective course "An early childhood teacher in a digital environment".

The research sample consisted of 35 third-year students of the Preschool Teacher Training and Business Informatics College of Applied Studies - Sirmium who took and passed the exam in the elective course "An early childhood teacher in a digital environment" (Table 1). The research was realized during the summer term of the school year 2020/2021.

Table 1. General characteristics of the respondents

	[ALL] *N=35*
Gender:	
Male	0 (0%)
Classes Female	35 (100%)
Rating, mean ± standard deviation (range)	8,31±1,18 (6 – 10)

Based on the Rulebook on Standards of Competences for the profession of an early childhood teacher and his professional development ("Official Gazette of RS – Education Gazette", No. 16/2018), a scale for the self-assessment of students' competence was constructed for the purposes of this research. The students performed the evaluation of their competence immediately before attending lectures (February, 2021) and after passing the exam for the elective course "An early childhood teacher in a digital environment" (July, 2021) through a Google questionnaire, which was distributed to them by email.

The first part of the questionnaire contained questions for collecting general information about the respondents (respondents' gender and results in the exam in the elective course, "An early childhood teacher in a digital environment"). The second part of the questionnaire was a five-point Likert-type scale, consisting of twenty-eight statements (items) (Table 2). The questionnaire showed high reliability (Cronbach's Alpha = 0.903).

Table 2. Claims (IT items) from the research instrument

Code	Item Definition Code
IT1	I can use digital technologies in finding and collecting relevant information and educational materials for early childhood educational practice.
IT2	I can use digital technologies in planning early childhood educational practice.
IT3	I can use digital technologies to follow modern professional literature and trends in the development of early childhood education
IT4	I can use digital technologies to share information with family, colleagues, associates, the local community and other stakeholders and institutions.
IT5	I can use digital technologies together with children to access information and different sources of learning.
IT6	I can use digital technologies to summarize, compare and consolidate information from different digital sources.

IT7	I can use digital technologies together with children to express and present in the function of play and research.
IT8	I can use digital technologies in the implementation of professional development (online seminars, for professional contributions and materials, to access various platforms for exchange).
IT9	I can use digital technologies together with children to document various activities and processes in the early childhood group, kindergarten, local community.
IT10	I can use digital technologies in the realization of a parent meeting (for preparation and presentation, for presentation of practice, for creating questionnaires, materials ...).
IT11	I can use appropriate digital tools to create materials for early childhood educational practice.
IT12	I can use the possibilities of free access to educational resources (applications, platforms) to support children's play and research.
IT13	I can use digital technologies to document and analyze my own practice (video camera, camera, computer).
IT14	I can use digital tools to participate in the development of reflective practice through collaboration, exchanges and joint research with professional associates and colleagues.
IT15	I can use digital tools to organize and classify information (chart diagrams, charts, planners, schedules, mind maps, animations, video tutorials, etc.).
IT16	I can use digital technologies for managing pedagogical documentation (for managing thematic/project portfolio, monitoring project activities, children's statements).
IT17	I can use digital tools to engage in the local community to promote the rights of the child and the family and to promote pre-school education.
IT18	I use digital technologies to document children's learning and development (children's portfolio).
IT19	I use digital technologies to promote preschool education and the profession of educators by participating in professional gatherings, publishing professional papers.
IT20	I know ways to develop children's habits for the safe use of digital technologies.
IT21	I know how to work with parents on the safe use of digital technologies.
IT22	As a future early childhood teacher, I believe that I am always able to control the shortcomings and dangers of the application of digital technologies.
IT23	I am aware of the disadvantages and dangers of children's use of digital technologies.
IT24	I consider myself competent to use digital technologies in the field of professional development.
IT25	I believe that I am competent to use digital technologies in the field of professional public action.
IT26	I believe that I am competent to use digital technologies in the field of direct work with children.
IT27	I consider myself competent to use digital technologies in the field of program development.
IT28	I think it is important for an early childhood teacher to use digital technologies for their professional development.

Frequencies, percentages, and sample mean value (arithmetic mean) with the corresponding standard deviation were used to describe the parameters of importance, depending on their nature. Both the minimum and the maximum sample values of numerical variables are presented. Principal components (Direct Oblimin Rotation) were used to examine the factor structure of the questionnaire. The reliability of the questionnaire was determined by the Cronbach's Alpha coefficient. Paired Samples t-Test was used to examine the differences before and after the program (two time intervals). The probability level was set at $p \leq 0.05$. Statistical processing and analysis were done in the statistical package SPSS ver. 25.0 (Statistical Package for the Social Sciences) for Windows.

The respondents were asked to express their degree of agreement with 28 statements of the questionnaire on the Likert five-point scale (1 = I do not agree at all, 5 = I completely agree). The factor structure of the questionnaire was examined. Direct Oblimin Rotation of the factors was used. The formation of the factor model is based on the assumption that variables can be grouped into different groups according to their correlations. Within each group there are mutually highly correlated variables. The intrinsic values are shown in Table 3. The intrinsic value is the part of the variance that is explained by one main component, and the goal is to extract as much of the variance as possible in the first few main components. According to the Kaiser-Guttman criterion, factors with an intrinsic value greater than 1 should be retained. According to this criterion, two components meet the condition, explaining a total of 43.2% of the variance. The first main component explains 32.9% of the total variance, while the second main component explains 10.3% of the variance. By examining the interrelationship of the obtained factors, it was found that the correlation was low (r = 0.209).

Table 3. Intrinsic values

Component	Intrinsic value	Percentage of total variance	Cumulative percentage of total variance
1	9,221	32,932	32,932
2	2,884	10,3	43,232

Display of components with Intrinsic values above 1.

The grouping of items around individual factors is shown in Table 4. Two factors have been singled out. The first factor consists of 18 items of the questionnaire, with factor saturations on this factor ranging from 0.884 to 0.467. The second factor consists of 10 items with a factor saturation of 0.612 to 0.482. The factors are named on the basis of the items that make them up: *Professional development and professional public action* and *Development of a real program and direct work with children*.

Table 4. Factor structure of the questionnaire

Factors	Items	Component	
		1	2
	IT 21	0,884	
	IT 23	0,834	
	IT 27	0,826	
	IT 25	0,779	
	IT 24	0,719	
	IT 20	0,695	
	IT 28	0,693	-0,353
Professional	IT 10	0,666	
development	IT 26	0,655	
and professional	IT 15	0,644	
public action	IT 22	0,644	
	IT 19	0,632	
	IT 18	0,629	
	IT 3	0,555	
	IT 17	0,549	0,451
	IT 16	0,519	
	IT 8	0,501	
	IT 14	0,467	0,338
	IT 1		0,818
	IT 4		0,612
	IT 12	0,349	0,612
Developing a	IT 13		0,599
real program	IT 9		0,576
and direct work	IT 5		0,559
with children	IT 11	0,304	0,489
	IT 6		0,482
	IT 7		0,477
	IT 2		0,320

Principal Component Analysis. Direct Oblimin.
Factor saturations greater than 0.3 are shown.

RESULTS AND DISCUSSION

The self-perception of students' competence for the application of digital technologies in early childhood educational practice was examined before and after the implemented program (Table 5). Differences in use were tested by t-Test for paired samples. Differences were noted in almost all items of the questionnaire. After deciding on the elective course and passing the exam, the respondents believe, in relation to the initial measurement, that they are more competent in the following fields of use: digital technologies in finding and collecting relevant information and educational materials for the early childhood educational practice (IT1); digital technologies in the planning of the early childhood educational

practice (IT2); digital technologies for monitoring modern professional literature and trends in the development of preschool education (IT3); digital technologies for the exchange of information with family, colleagues, associates, local community, and other stakeholders and institutions (IT4); digital technologies for summarizing, comparing and aggregating information from different digital sources (IT6); digital technologies together with children for expression and presentation in the function of play and research (IT7); digital technologies together with children for documenting various activities and processes in the early childhood group, kindergarten, and local community (IT9); digital technologies in the realization of meetings with parents (IT10); appropriate digital tools for creating materials for the early childhood educational practice (IT11); free access to educational resources (applications, platforms) in support of children's play and research (IT12); digital technologies for documenting and analyzing one's own practice (IT13); digital tools for participating in the development of reflective practice through cooperation, exchange and joint research with professional associates and colleagues (IT14); digital tools for organization and classification of information (IT15); digital technologies for keeping pedagogical documentation (IT16); digital tools for engaging in the local community to promote the rights of children and families, and to promote preschool education (IT17); digital technologies for documenting children's learning and development (IT18); and digital technologies for promoting preschool education and the profession of an early childhood teacher by participating in professional gatherings, publishing professional papers (IT19). The respondents showed higher scores after the program in relation to the initial testing on the following items: I know ways to develop children's habits for safe use of digital technologies (IT20); I know how to cooperate with parents in terms of the safe use of digital technologies (IT21); I believe that as an aspiring early childhood teacher I am always able to control the shortcomings and dangers of the application of digital technologies (IT22); I consider that I am competent to use digital technologies in the field of professional development (IT24); I consider that I am competent to use digital technologies in the field of professional public action (IT25); I think I am competent to use digital technologies in the field of direct work with children (IT26); and I consider myself competent to use digital technologies in the field of program development (IT27).

No statistically significant difference was found for the following items: I use digital technologies together with children to access information and different sources of learning (IT5); I use digital technologies within the realization of professional training (IT8); I am familiar with the shortcomings and dangers of children using digital technologies (IT23); and I think it is important that digital technologies are used for the professional development of early childhood teachers (IT28).

Table 5. Self-assessment of the use of digital technologies in the early childhood educational practice before and after the course

Items	I measurement	II measurement	95% Confidence Interval of the Difference		t	df	*p* Value
			Lower	Upper			
IT1	4,2±0,68	4,74±0,44	-0,784	-0,302	-4,584	34	< 0,001
IT2	3,8±0,53	4,54±0,51	-0,998	-0,488	-5,928	34	< 0,001
IT3	4,06±0,68	4,4±0,5	-0,665	-0,021	-2,163	34	0,038
IT4	4,17±0,71	4,51±0,51	-0,606	-0,080	-2,652	34	0,012
IT5	3,94±0,87	4,2±0,72	-0,624	0,109	-1,426	34	0,163
IT6	3,97±0,66	4,34±0,48	-0,636	-0,107	-2,853	34	0,007
IT7	3,66±0,73	4,49±0,51	-1,123	-0,534	-5,720	34	< 0,001
IT8	4,43±0,74	4,6±0,5	-0,466	0,123	-1,183	34	0,245
IT9	3,46±0,92	4,29±0,62	-1,241	-0,416	-4,084	34	< 0,001
IT10	3,43±1,09	4,37±0,73	-1,414	-0,472	-4,069	34	< 0,001
IT11	3,29±1,05	4,29±0,57	-1,391	-0,609	-5,201	34	< 0,001
IT12	3,77±0,94	4,4±0,55	-0,930	-0,327	-4,239	34	< 0,001
IT13	3,77±0,73	4,57±0,56	-1,131	-0,469	-4,909	34	< 0,001
IT14	3,49±0,7	4,43±0,61	-1,231	-0,655	-6,655	34	< 0,001
IT15	3,89±0,9	4,37±0,6	-0,862	-0,110	-2,625	34	0,013
IT16	3,09±1,12	4,14±0,55	-1,528	-0,586	-4,563	34	< 0,001
IT17	3,6±1,01	4,34±0,64	-1,186	-0,299	-3,404	34	0,002
IT18	3,43±0,81	4,26±0,74	-1,265	-0,392	-3,855	34	< 0,001
IT19	3,51±1,15	4,14±0,55	-1,100	-0,157	-2,707	34	0,011
IT20	3,51±0,78	4,23±0,65	-1,043	-0,386	-4,415	34	< 0,001
IT21	3,49±1,04	4,14±0,6	-1,020	-0,295	-3,683	34	0,001
IT22	3,49±0,82	4,2±0,58	-1,043	-0,386	-4,415	34	< 0,001
IT23	4,26±0,7	4,4±0,55	-0,277	0,335	0,190	34	0,851
IT24	3,63±0,55	4,23±0,6	-0,891	-0,309	-4,190	34	< 0,001
IT25	3,49±0,74	4,06±0,59	-0,897	-0,246	-3,565	34	0,001
IT26	3,69±0,53	4,23±0,55	-0,811	-0,275	-4,117	34	< 0,001
IT27	3,46±0,66	4,17±0,51	-1,021	-0,407	-4,730	34	< 0,001
IT28	4,14±0,69	4,4±0,55	-0,525	0,011	-1,950	34	0,059

Mean ± standard deviation is shown in the table.
Abbreviations: t=paired t-test, df=degree of freedom.

We also examined whether the score on the components of the questionnaire was statistically significantly different before and after the implemented program (Table 6). There are statistically significant differences on both factor 1 (Professional development and professional public action) (3.66 ± 0.55 vs. 4.28 ± 0.34, p <0.001) and factor 2 (Real program development and direct work with children) (3.80 ± 0.40 vs. 4.43 ± 0.31, p <0.001) before and after the program.

The results of our research are in compliance with the results of a study conducted by Romero-Tena et al., whose results indicate that attending the course "Application of Information and Communication Technology in Preschool" was a key element for improving the self-

perception of the digital competence of aspiring early childhood teachers (Romero-Tena et al., 2020).

Table 6. Self-assessment of components of digital technologies application in early childhood educational practice before and after program implementation

Components	I measurement	II measurement	95% Confidence Interval of the Difference		t	df	*p* Value
			Lower	Upper			
F1	3,66±0,55	4,28±0,34	-0,839	-0,388	-5,532	34	<0,001
F2	3,80±0,40	4,43±0,31	-0,788	-0,479	-8,343	34	<0,001

Mean ± standard deviation is shown in the table.
Abbreviations: t=paired t-test, df=degree of freedom.

The sample consisted of 4th year students of early childhood educational studies who attended the University of Seville during the academic years 2016/2017, 2017/2018 and 2018/2019. A total of 535 students participated in the research. Statistically significant changes were found before and after the implementation of teaching in the mentioned subject. In the study of their profiles, changes in the self-perception of their competence were identified: while before the training students were grouped into newcomers and categories of researchers, after the training they were grouped into the highest profiles – those of an integrator and an expert (Romero-Tena et al., 2020).

Both our and the above-mentioned research point to the importance of and need for enabling an aspiring early childhood teacher to acquire an adequate education during their studies in order to ensure that the student perceives himself/herself competent enough to integrate digital technologies into their future professional practice.

CONCLUSION

In this paper, we wanted to shed light on two issues related to the implementation of digital technologies into early childhood educational practice: how to design a curriculum that supports the development of students'/aspiring early childhood teachers' competencies for the integration of digital technologies into their early childhood educational practice, and whether a carefully designed and implemented subject syllabus contributes to a change in students' self-perception of digital competence for the integration of digital technologies into their future professional practice.

We decided on these two questions based on research findings that indicate, on the one hand, that the hindering factor in the development of digital competences of teachers/early childhood teachers and the imple-

mentation of digital technologies may appear in the training of teachers/early childhood teachers at different levels of professional development, because little support for certain digital skills is offered, and little attention is paid to the use of technology in the function of children's learning and development (Liu, Toki & Pange, 2014). On the other hand, research findings also indicate that one of the important factors that determines whether future educators will integrate digital technologies in their future work is their self-perception of the use of digital technologies, that is, the self-perception of competence for the integration of digital technologies into future professional practice (Romero-Tena et al., 2020).

The results of the study show that aspiring early childhood teachers assess their competence for the integration of digital technologies into early childhood educational practice more positively after attending lectures and taking the exam in the optional course "An early childhood teacher in a digital environment". Moreover, aspiring early childhood teachers are of the opinion that their digital competencies improved after attending the lectures of the subject program and passing the exam within both separate factors: *Professional development and professional public action* and *Development of a real program and direct work with children*. Namely, aspiring early childhood teachers feel more competent to apply digital technologies in all four areas of early childhood teachers' work: direct work with children, real program development, professional development and professional public action. These results are encouraging, as research findings indicate that attitudes, the development of digital competencies and adequate training have a positive impact on the integration of digital technologies into early childhood educational practice (Gialamas & Nikolopoulou, 2010) and that, on the other hand, the same factors may hinder digital technology integration into early childhood educational practice (Sillat, Kollom & Tammets, 2017).

We believe that this is the result of the research related to the content of the program and the questionnaire itself being harmonized with the modern understanding of a child, their learning and development, and the role of early childhood teacher and new educational policy documents. This points to the importance of the integration of digital technologies as a learning resource into the preschool education program, and to the fact that the integration should be framed by the conceptual starting points of the program. Furthermore, this implies harmonization of the subject syllabi within the study programs for early childhood teachers' education with theoretical settings and requirements of early childhood educational practice. The next step is to harmonize first- and second-order barriers, external and internal, as Ertmer et al. (2012) call them, in order to adequately support the integration of digital technologies into early childhood educational practice during their studies.

We see the limitation of this research in a small sample of respondents and in its reliance only on the aspiring early childhood teacher's self-perceptions. Further research should be focused on examining and understanding the students' competence for the integration of digital technologies in their direct work in a kindergarten during methodological exercises and/or professional practice. Based on these findings, the subject syllabus is to improve.

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САМОПЕРЦЕПЦИЈА КОМПЕТЕНТНОСТИ БУДУЋИХ ВАСПИТАЧА ЗА ИНТЕГРАЦИЈУ ДИГИТАЛНИХ ТЕХНОЛОГИЈА У ВАСПИТНО-ОБРАЗОВНУ ПРАКСУ

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Резиме

Будући да су дигиталне технологије саставни део контекста одрастања деце, рад се посредно бави питањем укључивања дигиталних технологија у праксу предшколског васпитања и образовања, а непосредно развојем компетенција будућих васпитача за интегрисање дигиталних технологија у њихову будућу праксу. Парадигматски помак од позитивистичке ка интерпретативној и критичкој парадигми условио је промене у сагледавању детињства и детета, васпитно-образовне праксе, као и улоге васпитача. У складу са тим помаком дошло је до промена у документима образовне политике Републике Србије. С друге стране, у недавним истраживањима се истиче да постоји неусклађеност између нивоа дигиталне компетентности која се очекује од будућих наставника/васпитача и обуке за интеграцију дигиталних технологија која им се пружа током образовања. Истраживања, такође, указују да перцепције које наставници/васпитачи имају о употреби дигиталних технологија могу снажно да утичу на њихову професионалну праксу. Полазећи од наведених промена и налаза истраживања обликовали смо и реализовали изборни предмет „Васпитач у дигиталном окружењу", којим смо настојали да допринесемо изградњи компетентности студената у домену интегрисања дигиталних технологија у васпитно-образовну праксу, у сва четири подручја рада васпитача: подручја непосредног рада са децом, подручја развијања реалног програма, подручја професионалног развоја и подручја професионалног јавног деловања. Након одслушаног изборног предмета и положе-

ног испита, сагледали смо како студенти перципирају своју компетентност у домену коришћења дигиталних технологија у будућем раду. Самоперцепције компетентности будућих васпитача испитане су применом петостепене скале Ликертовог типа креиране на основу Правилника о Стандардима компетенција за професију васпитача и његовог професионалног развоја ("Сл. гласник РС – Просветни гласник", бр. 16/2018). С обзиром да су самопроцене компетентности будућих васпитача након положеног испита из изборног предмета „Васпитач у дигиталном окружењу" позитивније у сва четири подручја рада васпитача, важно је истаћи да начини интегрисања дигиталних технологија треба да буду уоквирени концепцијским полазиштима програма, а то даље имплицира усклађивање курикулума предмета у оквиру студијских програма за образовање васпитача са теоријским поставкама и захтевима васпитно-образовне праксе.